01 APR 1988



TECHNICAL MANUAL

INSTRUMENT CALIBRATION PROCEDURE

# AC CALIBRATION SYSTEM

## FLUKE 5200A/5205A AND 5200A OPT 05

AQ-63

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SECTION 1

INTRODUCTION AND DESCRIPTION

1.1 This procedure describes the calibration of the Fluke 5200A, 5200A Opt. 05, and 5200A/5205A AC Calibration System. The instrument being calibrated is referred to herein as the TI (Test Instrument).

1.2 All comments concerning this procedure should be directed to Metrology Engineering, Naval Weapons Station, Seal Beach, Corona Annex, Corona, California.

1.3 This procedure includes tests of essential performance parameters only. Any malfunction noticed during calibration, whether specifically tested for or not, should be corrected.

1.4 If the TI is a Fluke 5205A, it must be calibrated with the Fluke 5200A with which it is used. Otherwise, the calibration may not be valid.

NOTE

If the TI meets the calibration requirements described in this procedure, affix a special calibration label stating: "The output voltages of the TI have been calibrated to frequencies up to 100 kHz. If valid system requirements exist for voltages above 100 kHz, notify the Metrology Engineering Center, and provide specific information.

Table 1. Calibration Description

| TI Characteristics | Performance Specifications | Test Method |
|---|---|---|
| Frequency | 5200A or 5200A/5205A Range. 10 Hz to 1.1999 MHz in 5 decade ranges and adjustable to steps of five-digit resolution within each range. Tolerance: 100-Hz to 100 kHz ranges; ±(1% of setting +0.1% of range) 1-MHz range; ±(3% of setting +0.3% of range) | Tested with an electronic counter |

| TI Characteristics | Performance Specifications | Test Method |
|---|---|---|
| Distortion and noise | 5200A<br>1 mV to 100 V range<br>10 Hz to 100 kHz, ±(0.04% of setting +10 μV rms)<br>100 to 500 kHz, ±(0.3% of setting +30 μV rms)<br>500 kHz to 1 MHz, ±(1.0% of setting +30 μV rms)<br><br>5205A<br>1000 V range<br>10 Hz to 20 kHz, ±0.05% of setting<br>20 kHz to 50 kHz, ±0.07% of setting<br>50 to 100 kHz, ±0.1% of setting | Tested directly with the DMS, item 2.3, in subsection 4.2 or with a distortion analyzer and a notch filter as described in subsection 4.3 |
| Line regulation | 5200A or 5200A/5205A<br>±0.001% of setting change for a 10% change in line voltage | Tested by monitoring the TI output voltage and varying the line voltage to the TI |
| Load regulation | Load: Maximum change in output voltage from no load to full load. Assigned ±0.0061% of range for line-and-load variation<br><br>1-, 10-, and 100-volt range:<br>10 Hz to 10 kHz:<br>±0.005% of range<br>20 kHz: ±0.006% of range 1- and 10-volt range:<br>50 kHz: ±0.007% of range<br>100-volt range:<br>50 kHz: ±0.01% of range | Tested by monitoring the TI output voltage and changing the TI load from no load to full load |

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| TI Characteristics | Performance Specifications | Test Method |
|---|---|---|
| Output voltage | 5200A<br>Seven ranges with 20% overrange. Outputs from 100 μV to 120 V. Voltages from 100 V to 1199.999 V are available with 5205A<br>Tolerance:<br>1-, 10-, and 100-millivolt range:<br>10 Hz to 30 Hz:<br>±(0.1% of setting + 10 μV)<br>30 Hz to 20 kHz:<br>±(0.02% of setting + 10 μV)<br>20 kHz to 100 kHz:<br>±(0.05% of setting + 20 μV)<br>0.1 MHz to 1 MHz:<br>±(0.33% of setting + 30 μV)<br>1-, 10-, and 100-volt range: 10 Hz to 30 Hz:<br>±(0.1% of setting + 0.005% of range)<br>30 Hz to 20 kHz:<br>±(0.02% of setting + 0.002% of range)<br>20 kHz to 100 kHz:<br>±(0.05% of setting + 0.005% of range):<br>0.1 MHz to 1 MHz:<br>±(0.33% of setting + 0.03% of range):<br>1000 V range: 10 Hz to 30 Hz:<br>±(0.12% of setting + 0.005% of range)<br>30 Hz to 20 kHz:<br>±(0.04% of setting + 0.002% of range)<br>20 to 50 kHz:<br>±(0.08% of setting + 0.05% of range)<br>50 to 100 kHz:<br>±(0.10% of setting + 0.01% or range) | For ranges of 1 V and higher, comparison with a dv calibrator using a thermal voltage conversion technique; for ranges below 1 V, comparison with higher TI ranges using a voltage divider technique |

| TI Characteristics | Performance Specifications | Test Method |
|---|---|---|
| Error measurement | 5200A or 5200A/5205A<br>Tolerance:<br>X.1 range<br>0%: ±0.001%<br>0.3%: ±0.005%<br>X1 range<br>0%: ±0.01%<br>3%: ±0.05% | Tested using a differential voltmeter |

## SECTION 2

## EQUIPMENT REQUIREMENTS

### NOTE

Minimum use specifications are the principal parameters required for performance of the calibration, and are included to assist in the selection of alternate equipment, which may be used at the discretion of the using laboratory. Satisfactory performance of alternate items shall be verified prior to use. All applicable equipment must bear evidence of current calibration.

The instruments utilized in this procedure were selected from those known to be available at Navy calibration facilities, and the listing by make or model number carries no implication of preference, recommendation, or approval for use by other agencies. It is recognized that equivalent equipment produced by other manufacturers may be capable of equally satisfactory performance in this procedure.

| Item | Minimum Use Specification | Calibration Equipment |
|---|---|---|
| 2.1 Autotransformer | Range: Input 115 V, output adjustable between 105 and 125 V<br><br>Current: 10 A | General Radio W10MT3A |

| Item | Minimum Use Specification | Calibration Equipment |
|---|---|---|
| 2.2 Electronic counter | Frequency range: 10 Hz to 1.04 MHz<br>Uncertainty: ±0.2% of input freq. | Hewlett-Packard 5345A or 5245L; or Fluke 7261A Opt 010, 112, 529 |
| 2.3 Distortion Measurement System (DMS) | Frequency range: 24 Hz to 102 kHz, and DMS must be capable of measuring distortion down to 0.040% or less | Sound Technology 1700B option 003 |
| | NOTE<br>Items 2.4, 2.5, and 2.6 below are not required if item 2.3 is available for distortion measurements (Calibration subsection 4.2). | |
| 2.4 Distortion analyzer | Frequency range: 100 Hz to 102 kHz, capable of measuring distortion down to 0.05% | Hewlett-Packard 332A |
| 2.5 Notch filter | Frequency channels: 20 and 100 Hz, 1 and 20 kHz<br>Attenuation: -40 dB min. | White Instrument Laboratories 2970 |
| 2.6 Isolation transformer | 115 V/115 V, 60 Hz, 1ϕ, 150 W | Topax Inc. 70412 |
| 2.7 AV differential voltmeter | Range: 0.001 to 100 V<br>Frequency range: 50 Hz to 100 kHz<br>Uncertainty: used to indicate a reference | Fluke 883 AB, 887AB or 931 B |
| 2.8 Resistors | 20 ohms, ±2%, 1/2W<br>200 ohms, ±2%, 1W<br>2.000 ohms, ±2%, 10W<br>10 kΩ, ±2%, 50W<br>8.2 kΩ, ±5%, 1/4W | Stock items |
| 2.8.1 Capacitor | 100 pf, ±10%, 15 V, mica | Stock item |

| Item | Minimum Use Specification | Calibration Equipment |
|---|---|---|
| 2.9 Ratio transformer | Range: 0.1, 0.01, and 0.001 ratio settings<br>Frequency: 50 Hz to 1 kHz<br>Uncertainty: ±0.001% | Gertsch 1011 |
| 2.10 DV voltage calibrator | Range: 1 to 500 V<br>Uncertainty: ±0.003% | Fluke 332B or 332A |
| 2.11 Thermal transfer standard | Measurement uncertainty when corrected for ac-dc difference<br>±70 ppm of input<br>0.5 to 500 V, 10 Hz to 20 kHz<br>±120 ppm of input<br>0.5 to 500 V, 20 to 50 kHz<br>±150 ppm of input<br>1 to 100 V; 50 to 100 kHz<br>±200 ppm of input<br>100 to 500 V; 50 to 100 kHz | Fluke 540B |

## SECTION 3

## PRELIMINARY OPERATIONS

3.1 Connect the TI calibrator output to the power amplifier (5205A) input using cable assembly, P/N 341560, to mate the lower printed circuit board on the rear panel of the calibrator to the 25-pin connector on the rear panel of the power amplifier. Connect the shorting strap between the 5205A OUTPUT-LOW Terminal and the 5205A chassis-ground terminal.

3.2 Set all auxiliary equipment controls as necessary to avoid damage to the equipment and so that dangerous voltages will not be present on the output terminals when power switches are turned on.

3.3 Connect all equipment except the TI to the appropriate power source, and set all power switches to on. Set the autotransformer (item 2.1) for 105 volts output.

3.4 Set the TI controls as follows:

5200A:

| | |
|---|---|
| VOLTAGE RANGE switch to | 10 V |
| VOLTAGE setting to | 10 V |
| FREQUENCY RANGE switch to | 100 Hz |
| FREQUENCY switch to | 10 Hz |
| VOLTAGE ERROR % switch to | OFF |
| SENSE switch to | INT |
| PHASE LOCK switch to | OFF |
| CONTROL switch to | LOCAL |
| MODE switch to | STDBY |
| POWER switch to | OFF |

5205A:

| | |
|---|---|
| CONTROL switch to | REM-5200 |
| MODE switch to | STDBY-RESET |

WARNING

DURING CALIBRATION, VOLTAGES THAT ARE DANGEROUS TO HUMAN LIFE ARE PRESENT AT THE TI OUTPUT TERMINALS AND THE TI OUTPUT CABLE.

3.5 Connect the TI to the autotransformer; then set the TI POWER switch to ON, and allow a 60-minute warm-up period prior to performing any measurements.

SECTION 4

CALIBRATION PROCESS

NOTE

Unless otherwise specified, verify the results of each test and take corrective action whenever the test requirement is not met, before proceeding.

## 4.1 FREQUENCY TESTS

4.1.1 Connect the TI COUNTER OUTPUT (located on the rear of the TI) to the electronic counter (item 2.2) input connector.

4.1.2 Set the TI FREQUENCY RANGE switch and the FREQUENCY selection switches to each of the following settings at the line voltage indicated. At each setting, verify that the electronic counter indication is within the tolerances listed.

| Line Voltage | FREQUENCY Range Switch | FREQUENCY Selection Switches | Tolerance Limits |
|---|---|---|---|
| 105 V | 100 Hz | 10.00 Hz | 98.0 to 102.0 ms |
| " | " | 100.00 " | 9.89 to 10.11 " |
| 115 V | 1 kHz | 0.1111 kHz | 8.83 to 9.18 " |
| " | " | 0.2222 " | 4.43 to 4.57 " |
| " | " | 0.3333 " | 2.96 to 3.04 " |
| " | " | 0.4444 " | 439.0 to 449.8 Hz |
| " | " | 0.5555 " | 548.9 to 562.1 " |
| " | " | 0.6666 " | 658.9 to 674.3 " |
| " | " | 0.7777 " | 768.9 to 786.5 " |
| " | " | 0.8888 " | 878.9 to 898.7 " |
| " | " | 0.9999 " | 988.9 to 1010.9 " |
| " | " | 1.1111 " | 1099.0 to 1123.2 " |
| 125 V | 10 " | 5.000 " | 4940 to 5060 " |
| " | " | 10.000 " | 9890 to 10,110 " |
| " | 100 " | 50.00 " | 49,400 to 50,600 " |
| " | " | 100.00 " | 98,900 to 101,100 " |

4.1.3 Set the TI MODE switch to STDBY, and disconnect the electronic counter.

4.1.4 Adjust the autotransformer output voltage to 115 V.

## 4.2 HARMONIC DISTORTION AND NOISE MEASUREMENTS USING THE DMS (ITEM 2.3)

NOTE

If the DMS is not available proceed to subsection 4.3 for measurements without the use of the DMS.

4.2.1 Ensure that the following equipment controls are set as follows:

TI CONTROLS:

5200A:

| | |
|---|---|
| MODE switch to | STDBY |
| VOLTAGE RANGE to | 100 mV |
| VOLTAGE output-dials setting to | 100.0000 (mV) |
| VOLTAGE ERROR % switch to | OFF |
| FREQUENCY RANGE - Hz switch to | 100 |

5205A:

| | |
|---|---|
| MODE selector to | STDBY |
| CONTROL to | REMOTE |
| POWER to | ON |

DMS CONTROLS:

| | |
|---|---|
| RATIO selector to | 100 PERCENT |
| INPUT selector to | 300 AC VOLTS |
| VOLTS POWER pushbutton to | Depressed (IN) position |
| FAST RESPONSE/LOW DISTORTION selector to | LOW DISTORTION |
| ADJUST control fully ccw to | AUTO position |
| SIGNAL COMMON selector to | FLOAT |

4.2.2 Connect the equipment as shown in Figure 1.

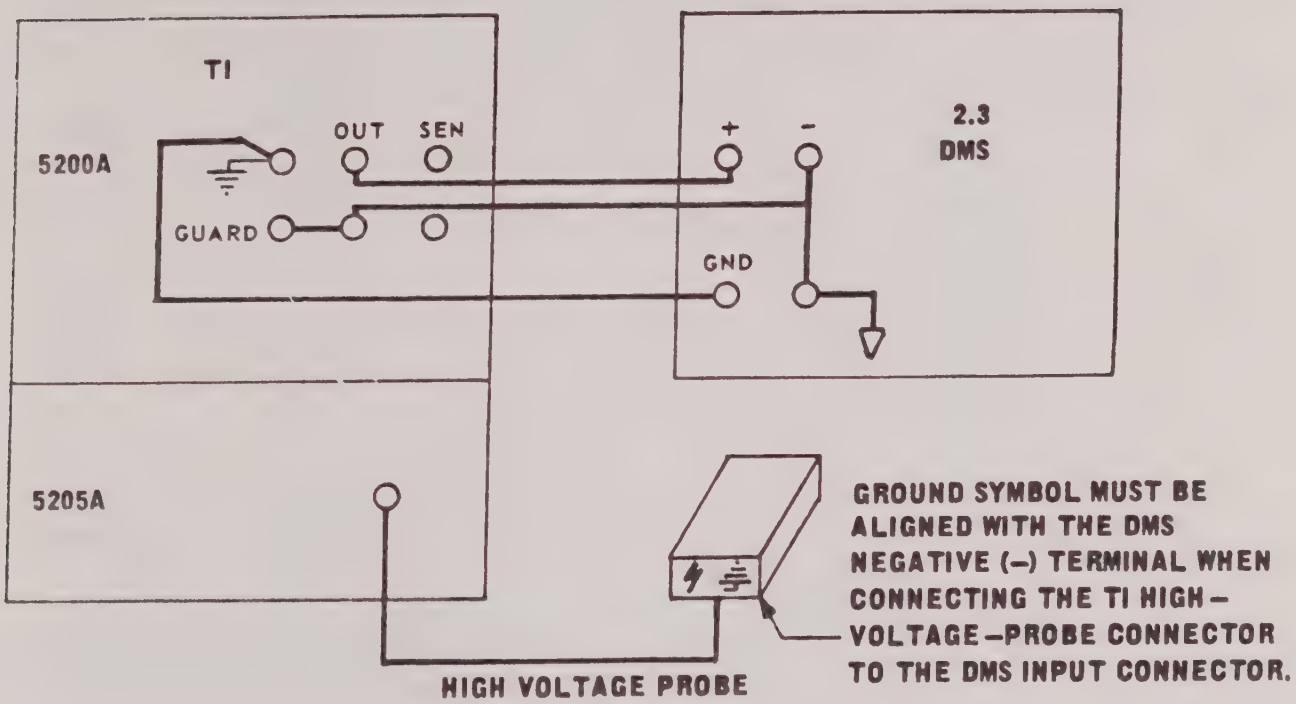



Figure 1. Distortion Measurements with the DMS

4.2.3 Perform the measurements tabulated below as follows:

4.2.3.1 Set the TI VOLTAGE RANGE and the TI frequency controls as required to obtain the voltage and the frequency values listed below.

4.2.3.2 Set the DMS INPUT selector switch to an AC-VOLTS position that is equivalent to the voltage listed for the measurements; and set the DMS FREQUENCY controls to obtain the frequency setting listed.

| TI & DMS | | DMS FILTERS | | |
|---|---|---|---|---|
| VOLTAGE | FREQUENCY | 400 Hz | 80 kHz | Tolerance Limits |
| 100 mV | 25 Hz | OUT | IN | 0.050% or less |
| 1V | " | " | " | 0.041% " |
| 10 V | " | " | " | 0.040% " |
| 100 V | " | " | " | 0.040% " |
| 100 V | 10 kHz | IN | " | 0.040% " |

| TI & DMS | | DMS FILTERS | | |
|---|---|---|---|---|
| VOLTAGE | FREQUENCY | 400 Hz | 80 kHz | Tolerance Limits |
| 10 V | 10 kHz | IN | IN | 0.040% or less |
| 1 V | " | " | " | 0.041% " |
| 100 mV | " | " | " | 0.050% " |
| 100 mV | 50 kHz* | " | OUT | 0.050% " |
| 1 V | " | " | " | 0.041% " |
| 10 V | " | " | " | 0.040% " |
| 100 V | " | " | " | 0.040% " |
| 100 V | 100 kHz* | " | " | 0.140% " |
| 10 V | " | " | " | 0.141% " |
| 1 V | " | " | " | 0.141% " |
| 100 mV | " | " | " | 0.150% " |
| 300 V** | " | " | " | 0.200% " |
| 300 V** | 50 kHz* | " | " | 0.090% " |
| 300 V** | 10 kHz | " | " | 0.050% " |
| 300 V** | 25 Hz | OUT | IN | 0.050% " |

*Tolerance Limit includes residual distortion of DMS, item 2.3.
**High-volume output; TI VOLTAGE RANGE is set to 1000 V.

4.2.3.3 Set the TI MODE selector to OPER, and depress the DMS DISTORTION pushbutton.

4.2.3.4 If the DMS frequency mode of operation is unstable, fine tune the equipment frequency-controls setting, more or less than the listed frequency value, by resetting the DMS (and/or the TI) frequency controls as required until both of the DMS NOTCH-FREQUENCY LOW-HIGH indicators are off.

NOTE

The operation of the DMS frequency pushbutton may not always cause the internal DMS oscillator to go through its automatic stabilization cycle. If the oscillator appears unstable, momentarily set the FAST RESPONSE/LOW DISTORTION switch to the FAST RESPONSE position and then return it immediately to the LOW DISTORTION position.

4.2.3.5 Set the DMS pushbutton FILTERS to the settings indicated.

4.2.3.6 Set the DMS RATIO selector switch progressively to a lower PERCENT range, setting the DMS SIGNAL-COMMON selector to either FLOAT or ⏚ as required for the lowest % meter indication.

4.3.2 Set the TI controls as follows:

| | |
|---|---|
| FREQUENCY RANGE switch to | 100 Hz |
| FREQUENCY switch to | 100 Hz |
| VOLTAGE RANGE switch to | 1 V |
| VOLTAGE setting to | 0.300000 |
| MODE switch to | OPER |

4.3.3 Set the controls of the distortion analyzer to obtain a reference set level of 100% meter indication.

4.3.4 Set the frequency output of the distortion analyzer to indicate 100 Hz initially. Set the distortion analyzer to measure distortion.

4.3.5 Tune the controls of the distortion analyzer, such as the frequency and the balance controls, for the lowest meter indication.

4.3.6 Adjust the controls of the distortion analyzer to progressively more sensitive ranges, while tuning the controls to obtain minimum % indication. Verify that the indicated distortion is 0.07% or less.

4.3.7 Set the % distortion range switch to 100%.

4.3.8 Set the functional selector switch of the distortion analyzer to the voltmeter position.

4.3.9 Set the TI MODE switch to STANDBY, and disconnect the distortion analyzer from the TI.

4.3.10 Connect the notch filter as indicated by the dotted lines in Figure 2.

4.3.11 Set the notch-filter-frequency control to 100 Hz, set TI Mode switch to OPER, and adjust the TI frequency for a minimum voltmeter indication.

4.3.12 Set the TI controls as follows:

| | |
|---|---|
| VOLTAGE RANGE switch to | 10 V |
| VOLTAGE setting to | 03.0000 |

4.3.13 Set the distortion analyzer function selector to measure distortion.

4.3.14 Repeat step 4.3.6, and verify that the indicated distortion is 0.43% or less.

NOTE

The TI distortion tolerances have been increased by 0.03% to allow for possible distortion introduced by the analyzer. When using the notch filter as outlined, the effective measurement error caused by distortion generated in the analyzer is reduced 10 times. The distortion relative to the TI output voltage level is 1/10 the indicated value on the analyzer. For measurement simplicity, the tolerance is listed to correspond to the analyzer scale being used.

4.3.15 Set the distortion analyzer controls as follows:

| | |
|---|---|
| Meter range selector to | 100% |
| Function selector to | set level position |
| Sensitivity control | fully ccw |

4.3.16 Set the TI MODE switch to STANDBY.

4.3.17 Disconnect the notch filter from the TI, and connect the distortion alyzer to the TI as shown in Figure 2 without the notch filter.

4.3.18 Set the TI controls as follows:

| | |
|---|---|
| FREQUENCY RANGE switch to | 1 kHz |
| FREQUENCY switch to | 1000 Hz |
| VOLTAGE RANGE switch to | 1 V |
| VOLTAGE setting to | 0.300000 |

4.3.19 Repeat steps 4.3.3 through 4.3.17 except set the distortion analyzer equency controls to 1 kHz at step 4.3.4 and the notch filter frequency ntrol to 1 kHz at step 4.3.11. Verify that the indicated distortion is 07% or less in step 4.3.6 and is 0.43% or less in step 4.3.14.

4.3.20 Set the TI controls as follows:

| | |
|---|---|
| FREQUENCY RANGE switch to | 100 kHz |
| FREQUENCY switch to | 20 kHz |
| VOLTAGE RANGE switch to | 1 V |
| VOLTAGE setting to | 0.300000 |

4.3.21 Repeat steps 4.3.3 through 4.3.17 except set the distortion analyzer frequency controls to 20 kHz at step 4.3.4 and the notch filter frequency control to 10 kHz at step 4.3.11. Verify that the indicated distortion is 0.07% or less in step 4.3.6 and is 0.43% or less in step 4.3.14.

4.3.22 Set the TI controls to each of the following settings. At each setting, set the distortion analyzer Function Selector to Set Level, and adjust the Meter Range selector and Sensitivity Vernier controls to obtain a full-scale meter indication; then set the frequency controls to the corresponding TI frequency, switch the Function Selector to Distortion, readjust the Meter Range selector, and tune the frequency controls to measure distortion. Verify that the indicated distortion is not greater than the tolerance listed.

NOTE

Return the distortion analyzer METER RANGE selector to 100 and the Function Selector to Set Level before proceeding to each succeeding TI setting.

The distortion limits specified are the sum of the possible distortion introduced by the distortion analyzer and the distortion tolerance specified by the manufacturer for the TI.

| TI | | | | Tolerance Limits |
|---|---|---|---|---|
| VOLTAGE RANGE Switch | VOLTAGE Setting | FREQUENCY RANGE Switch | FREQUENCY Setting | |
| *100 mV | 100.0000 | 100 Hz | 100.00 Hz | ±0.08% or less |
| " | " | 1 kHz | 1.0000 kHz | " " |
| " | " | 10 " | 10.000 " | " " |
| " | " | 100 " | 050.00 " | " " |
| " | " | 100 " | 100.00 " | " " |
| **1 V | 1.000000 | 100 Hz | 100.00 Hz | ±0.07% " |
| " | " | 1 kHz | 1.0000 kHz | " " |
| " | " | 10 " | 10.000 " | " " |
| " | " | 100 " | 050.00 " | " " |
| " | " | 100 " | 100.00 " | " " |
| 100 V | 100.0000 | 100 Hz | 100.00 Hz | ±0.07% " |
| " | " | 1 kHz | 1.0000 kHz | " " |
| " | " | 10 " | 10.000 " | " " |
| " | " | 100 " | 050.00 " | " " |
| " | " | 100 " | 100.00 " | " " |
| 1000 V | 0300.000 | 100 Hz | 100.00 Hz | ±0.08% " |
| " | " | 1 kHz | 1.0000 kHz | " " |
| " | " | 10 " | 10.000 " | " " |
| " | " | 100 " | 050.00 " | ±0.10% " |
| " | " | 100 " | 100.00 " | " " |

*Position the distortion analyzer Meter Range selector downscale to obtain a full-scale meter deflection, and use this new position as the 100% set-level position.

**Remove the resistor (item 2.8) and capacitor (item 2.8.1) from the test configuration and connect the TI output directly to the distortion analyzer input.

4.3.23 Set the distortion analyzer Meter Range selector to 100 and the Function Selector switch to SET LEVEL.

4.3.24 Set the TI MODE switch to STANDBY.

4.3.25 Disconnect the test configuration.

## 4.4 LINE AND LOAD REGULATION TESTS

4.4.1 Connect the equipment except the load resistor as shown in Figure 3.

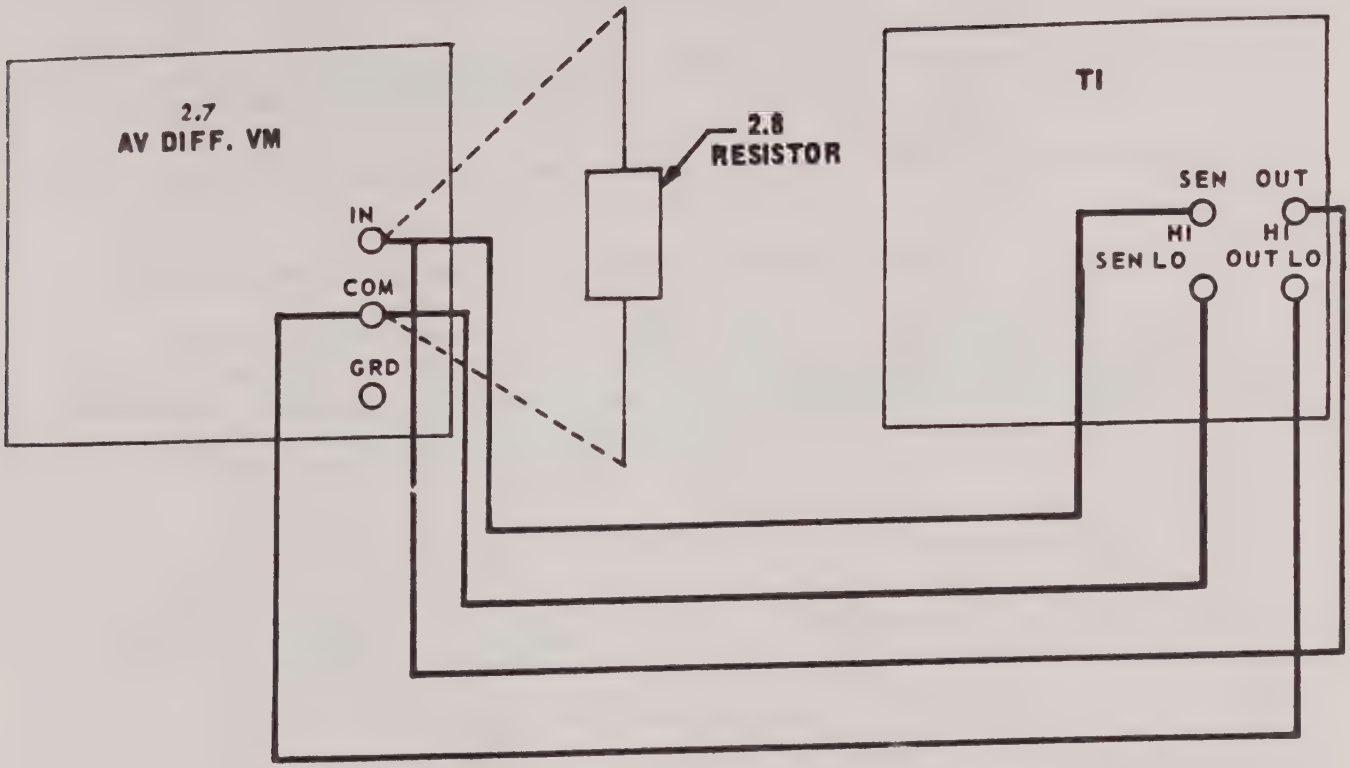



Figure 3. Line and Load Regulation Test Configuration

4.4.2 Set the TI controls as follows:

| | |
|---|---|
| VOLTAGE RANGE switch to | 1 V |
| VOLTAGE selection switches and indicators to | 1.000000 |
| FREQUENCY RANGE switch to | 100 kHz |
| FREQUENCY SELECTION switch to | 20 kHz |
| MODE switch to | OPER |
| SENSE switch to | EXT |

4.4.3 Null the differential voltmeter; note its indication for reference, and set its null-selector switch to TVM. Switching to TVM function is necessary to prevent meter pegging before making circuit changes.

4.4.4 Connect the 20Ω load as shown in Figure 3, adjust the autotransformer output voltage to 105 V.

4.4.5 Null the differential VM, and verify that its indication is within the noted-reference voltage ±61 μV.

4.4.6 Adjust the autotransformer output voltage to 125 V, and repeat step 4.4.5.

4.4.7 Adjust the autotransformer output voltage to 115 V.

4.4.8 Continue calibration in accordance with the following table: Operation (a) means null the differential voltmeter and note the indication for reference. Operation (b) means readjust the differential voltmeter to re-establish the reference null, and verify that the reference null is re-established within the tolerance limits listed.

| TI | | | Load | Operation | Tolerance Limits |
|---|---|---|---|---|---|
| Freq. Output | VOLTAGE RANGE | Voltage Output | | | |
| 30 Hz | 100 V | 100 V | None | (a) | Ref |
| " | " | " | 2 kΩ | (b) | ±5 mV or less |
| 20 kHz | 10 V | 10 V | None | (a) | Ref |
| " | " | " | 200Ω | (b) | ±600 μV or less |
| " | 1000 V | 500 V | None | (a) | Ref |
| " | " | " | 10 kΩ | (b) | ±50 mV or less |

4.4.9 Set the TI MODE switch to STDBY.

4.5 ERROR MEASUREMENT TESTS

4.5.1 Connect the equipment as shown in Figure 4.

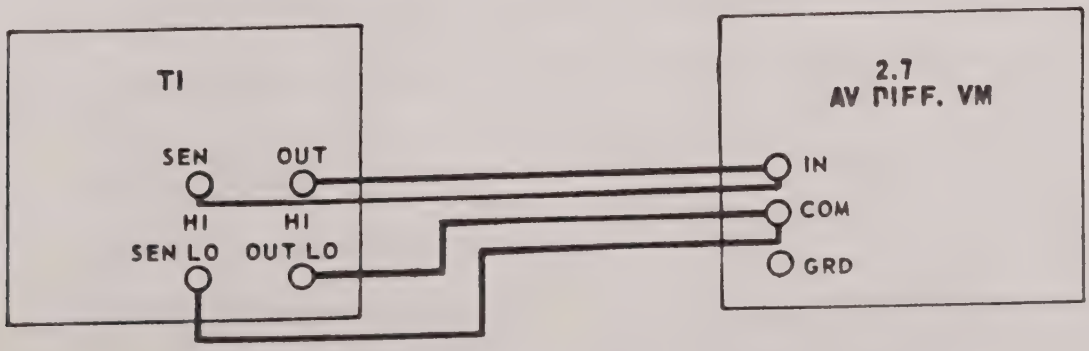



Figure 4. Error Measurement Test Configuration

4.5.2 Set the TI controls as follows:

| | |
|---|---|
| VOLTAGE RANGE switch to | 10 V |
| VOLTAGE selection switch to | 10.00000 |
| FREQUENCY RANGE switch to | 1 kHz |
| FREQUENCY selection switch to | 1.0000 kHz |
| VOLTAGE ERROR-% switch to | OFF |
| MODE switch to | OPER |

4.5.3 Obtain a reference null on the AV differential voltmeter. Then set the AV differential voltmeter to the TVM function.

4.5.4 Set the TI controls to the following settings. Then gradually reset the TI VOLTAGE selection switches to obtain the reference null on the AV differential voltmeter obtained in step 4.5.3. For each re-established reference null, verify that the TI VOLTAGE selection switches indication is within the applicable tolerance limits. Prior to each resetting to the TI settings, observe the manufacturer's AV voltmeter precautions.

| VOLTAGE ERROR-% switch | VERNIER Voltage error indicator | VOLTAGE Selection switch | Tolerance Limits (Volts) |
|---|---|---|---|
| X.1 range | 0 % | 10.00000 | 9.99990 to 10.00010 |
| " | 3 % | 10.03009 | 10.02959 to 10.03059 |
| " | -3 % | 9.97009 | 9.96959 to 9.97059 |
| X1 range | -3 % | 9.70874 | 9.70403 to 9.71345 |
| " | 3 % | 10.30928 | 10.30397 to 10.31460 |
| " | 0 % | 10.00000 | 9.99900 to 10.00100 |

4.6 VOLTAGE LINEARITY TESTS

4.6.1 Connect the equipment as shown in Figure 5.

4.6.2 Set the ratio transformer to indicate 0.1000000 and the TI controls as follows:

| | |
|---|---|
| VOLTAGE ERROR % switch to | X.1 |
| VERNIER Voltage Error set to | 0% |
| VOLTAGE switches set to | 10.00000 |

4.6.3 Adjust the differential voltmeter to establish a reference null.

4.6.4 Set the differential voltmeter to TVM function. (Repeat this step whenever making circuit changes in circuit-voltage settings to prevent meter pegging).

4.6.5 For each of the following TI and ratio transformer settings, adjust the TI ±% VERNIER error control to re-establish the reference null. Verify that each TI % VERNIER voltage indication at each re-established reference null is ±0.01% or less.

| TI VOLTAGE switches | Ratio Transformer |
|---|---|
| 9.99999 | 0.1000001 |
| 8.88888 | 0.1125001 |
| 7.77777 | 0.1285716 |
| 6.66666 | 0.1500002 |
| 5.55555 | 0.1800002 |
| 4.44444 | 0.2250002 |
| 3.33333 | 0.3000003 |
| 2.22222 | 0.4500005 |
| 1.11111 | 0.9000009 |

4.6.6 Set the TI controls for minimum voltage output.

4.6.7 Set the TI MODE switch to STDBY and disconnect the test configuration.

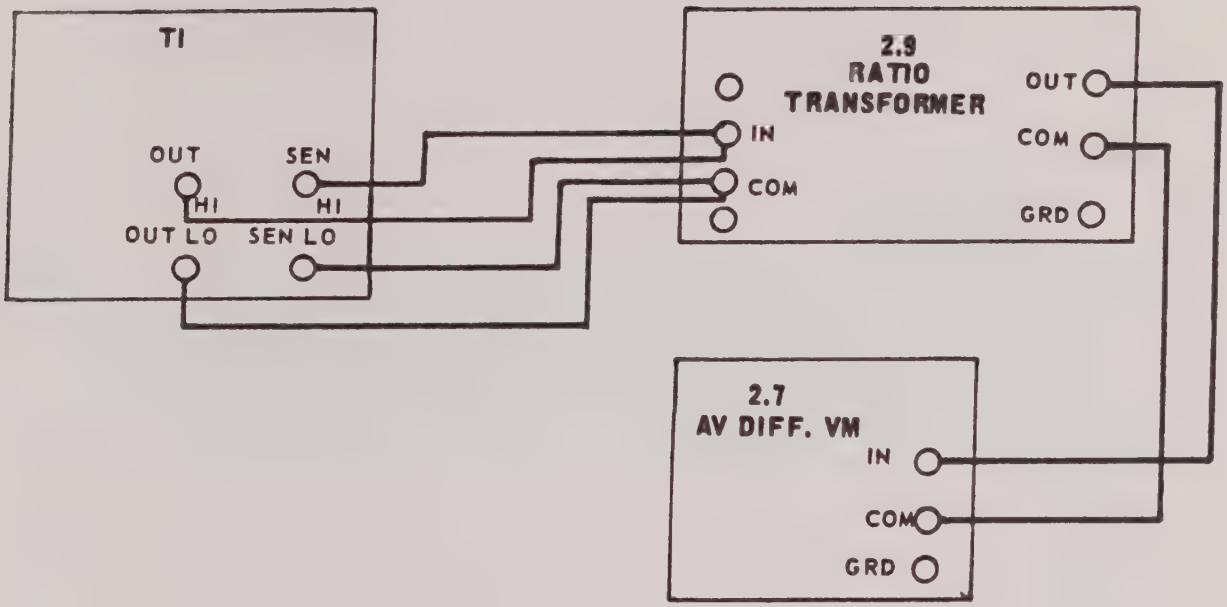



Figure 5. Voltage Linearity Test Configuration

4.7 VOLTAGE OUTPUT TESTS UP TO 100 kHz

NOTE

(Perform AC-DC difference corrections as given in the thermal transfer Standard's current Calibration Report).

4.7.1 1 V Range Accuracy Tests

4.7.1.1 Connect the equipment as shown in Figure 6.

4.7.1.2 Connect the equipment as follows:

| | |
|---|---|
| VOLTAGE RANGE switch to | 1 V |
| VOLTAGE setting to | 1 V |
| FREQUENCY RANGE switch | 100 Hz |
| FREQUENCY switch to | 10.000 |

| | |
|---|---|
| VOLTAGE ERROR % switch to | X.1 |
| SENSE switch to | EXT |
| MODE switch to | OPER |

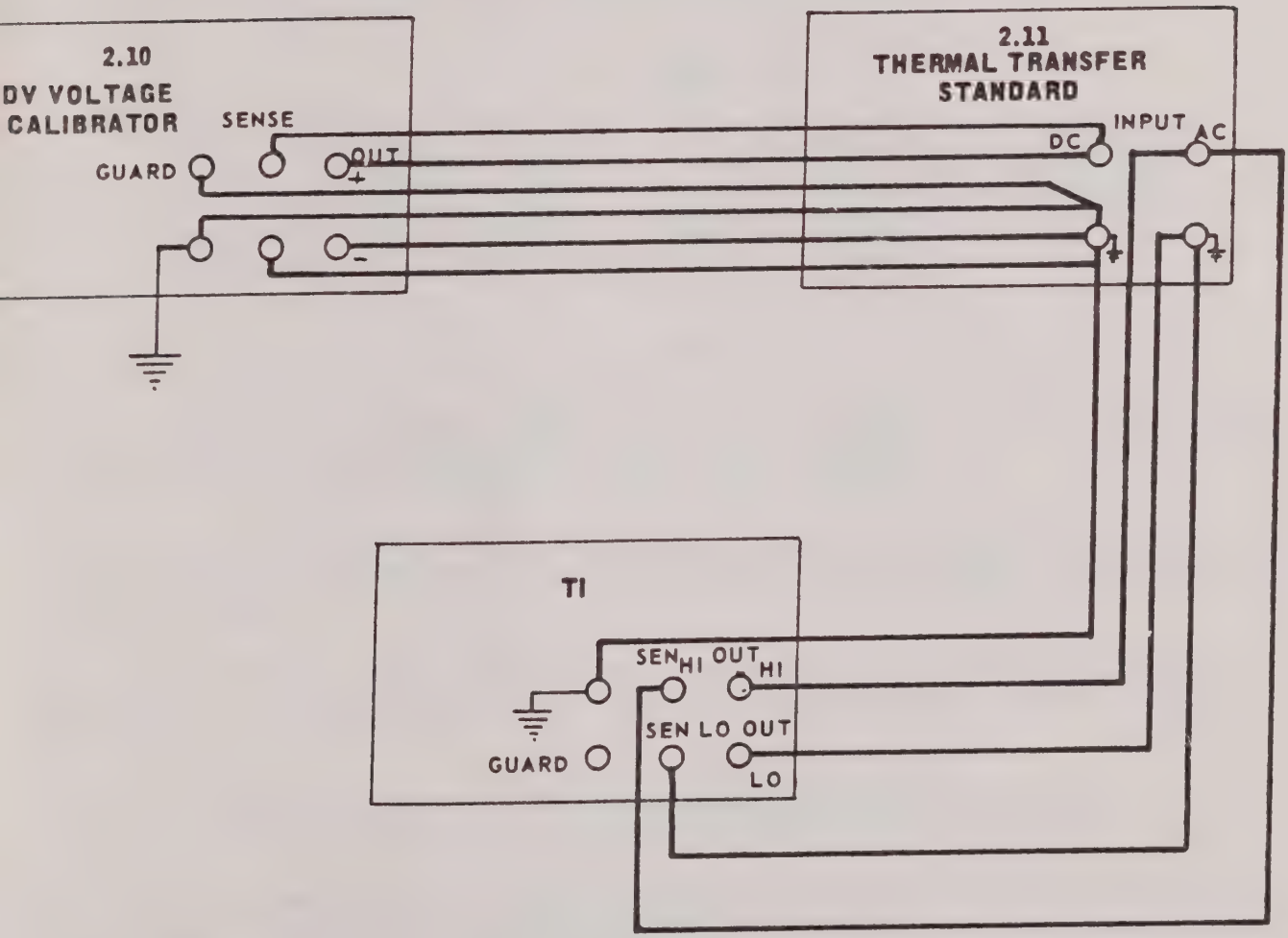



Figure 6. Voltage Output Test Configuration

4.7.1.3 Set the dv voltage calibrator controls for a 1 V output.

4.7.1.4 Set the thermal transfer standard (TTS) mode switch to the DC search position, selecting the correct range so that the percent input meter will indicate in the green area; then switch the mode switch to the DC transfer position. Establish a galvanometer null at its most sensitive range while maintaining an on-scale meter indication by adjusting the applicable reference-adjust control when switching to a more sensitive range.

NOTE

Allow for stabilization time. The Fluke 540B may initially take as long as 10 minutes; however, it is considered stabilized when the galvanometer indication drifts less than 2 small divisions per minute in its most sensitive position. Readjust the reference-adjust controls to re-establish the galvanometer null.

4.7.1.5 Set the TTS galv switch to open and the sensitivity switch to low.

4.7.1.6 Set the TTS mode switch to AC search, selecting the correct range switch setting so that the percent input meter indicates in the green area, then switch the mode switch to the AC transfer position.

4.7.1.7 Vary the TI ± VERNIER control as required to re-establish the galvanometer null indication. (Do not adjust the TTS reference controls while in the AC MODE).

4.7.1.8 Obtain a null indication successively in the "medium" and "high" positions of the TTS Sensitivity switch by adjusting the ± VERNIER control on the TI.

4.7.1.9 Allow 15 to 30 seconds for the galvanometer to stabilize. Verify that the VERNIER - Voltage error indication is ±0.105% or less.

4.7.1.10 Repeat steps 4.7.1.4 through 4.7.1.9 at each of the following frequencies. Use the TI ± VERNIER control to obtain a null indication on the TTS galvanometer in the AC TRANSFER MODE. At each setting, verify that the VERNIER - Voltage error indication is within the tolerances listed.

NOTE

Record the result of the measurements for use in step 4.7.5.2 through step 4.7.5.3 to establish reference settings for the calibration of millivolt ranges at 30 Hz, 20 kHz, and 100 kHz.

| Frequency | VERNIER - Voltage indication Tolerance Limits |
|---|---|
| 30 Hz | ±0.022% or less |
| 100 " | " |
| 1 kHz | " |
| 20 " | " |
| 50 " | ±0.055% or less |
| 100 " | " |

4.7.2 10 V Range Accuracy Tests

4.7.2.1 Set the TI controls as follows:

VOLTAGE RANGE switch to 10 V

VOLTAGE switch to 10.00000

4.7.2.2 Set the dv voltage calibrator controls for a 10 V output.

4.7.2.3 Perform steps 4.7.1.4 through 4.7.1.9 at each of the following TI frequencies:

| Frequency | VERNIER - Voltage indication |
|---|---|
| 10 Hz | ±0.105% or less |
| 50 " | ±0.022% " |
| 100 " | " " |
| 1 kHz | " " |
| 20 " | ±0.055% " |
| 50 " | " " |
| 100 " | " " |

4.7.2.4 Set the TI VOLTAGE selection switches to 1.000000.

4.7.3 100 V Range Accuracy Tests

4.7.3.1 Set the TI controls as follows:

| | |
|---|---|
| VOLTAGE RANGE switch to | 100 V |
| VOLTAGE switch to | 100.0000 |

4.7.3.2 Set the dv voltage calibrator controls for a 100 V output.

4.7.3.3 Perform steps 4.7.1.4 through 4.7.1.9 at each of the following frequencies. Use the TI ± VERNIER control to obtain a zero (null) indication on the TTS galvalometer in the AC TRANSFER MODE. At each setting, verify that the VERNIER - Voltage error indication is within the tolerances listed.

| FREQUENCY - Selection | Tolerance Limits |
|---|---|
| 10 Hz | ±0.105% or less |
| 50 " | ±0.022% " |
| 100 " | " " |
| 1 kHz | " " |
| 20 " | ±0.055% " |
| 50 " | " " |
| 100 " | " " |

4.7.4 1000 V Range Constant-Gain Accuracy Tests

4.7.4.1 Set the equipment controls for minimum output and set the TI controls as shown below:

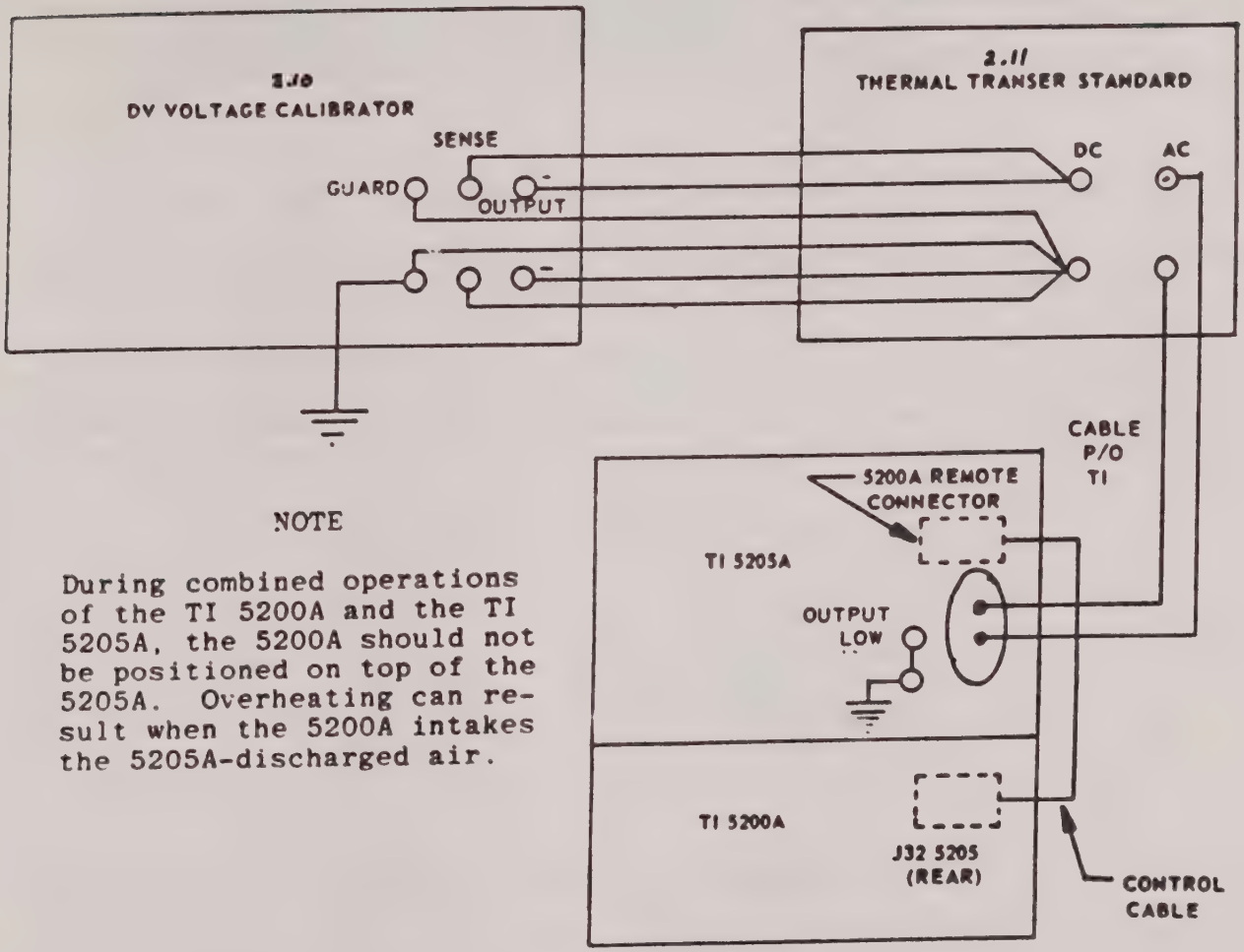
AC CALIBRATOR (5200A)

| | |
|---|---|
| MODE switch to | STDBY |
| VOLTAGE-RANGE switch to | 1000 V |
| VOLTAGE-Selection switches to | 500.00 V |
| SENSE switch to | INT |
| CONTROL switch to | LOCAL |
| PHASE-LOCK switch to | OFF |

POWER AMPLIFIER (5205A):

| | |
|---|---|
| MODE switch to | STDBY-RESET |
| CONTROL switch to | REM-5200 |

4.7.4.2 Connect the equipment as shown in Figure 7.




NOTE

During combined operations of the TI 5200A and the TI 5205A, the 5200A should not be positioned on top of the 5205A. Overheating can result when the 5200A intakes the 5205A-discharged air.

Figure 7. 1000 V Range Constant-Gain Test Configuration

CAUTION

WHEN TESTING THE 1000 V RANGE, DO NOT CONNECT OR DISCONNECT TEST LEADS TO THE TI HIGH VOLTAGE CABLE UNTIL THE OUTPUT IS DISABLED BY SETTING THE TI MODE SWITCHES TO STDBY. WHEN CONNECTING OR DISCONNECTING THE DV VOLTAGE CALIBRATOR, SET ITS POWER SWITCH TO "STANDBY."

CAUTION

THE OUTPUT-LOW TERMINAL OF THE 5205A SHOULD NEVER BE LEFT FLOATING DURING OPERATION. IF THE STRAP BETWEEN THE OUTPUT-LOW AND CHASSIS-GROUND TERMINAL IS NOT PRESENT, INSURE THAT A CONNECTION TO CHASSIS-GROUND IS PRESENT THROUGH THE OUTPUT CABLE AND THE LOAD.

4.7.4.3 Set the dv-voltage-calibrator controls for 500 V output.

4.7.4.4 Set the TI AC Calibrator (5200A) MODE switch to OPER. (The OPERATE indicators of the TI should illuminate on both units: 5200A and 5205A).

4.7.4.5 Perform steps 4.7.1.4 through 4.7.1.9 at each of the following frequencies. Use the TI ± VERNIER control to obtain a zero (null) indication on the TTS galvanometer in the AC TRANSFER MODE. At each setting, verify that the VERNIER-Voltage-error indication is within the tolerance limits listed.

| Frequency | Tolerance Limits |
|---|---|
| 30 Hz | ±0.130% or less |
| 20 kHz | ±0.044% or less |
| 50 kHz | ±0.09% or less |
| 100 kHz | ±0.12% or less |

4.7.4.6 Set the equipment controls for minimum output.

4.7.4.7 Set the equipment voltage controls and the TI frequency controls to obtain the settings indicated for the measurements below. For each measurement repeat steps 4.7.1.4 through 4.7.1.9, using the TI ± VERNIER controls to establish a zero (null) indication on the TTS galvanometer in the AC TRANSFER MODE. Verify that the TI VERNIER-Voltage- error indication is within the tolerance limits and set the equipment controls for minimum output before changing the voltage-control settings or test configurations.

| Voltage | Frequency | Tolerance Limits |
|---|---|---|
| 350 V | 30 Hz | ±0.134% or less |
| 350 V | 50 kHz | ±0.094% or less |
| 300 V | 100 kHz | ±0.133% or less |
| 200 V | 50 kHz | ±0.105% or less |
| 200 V | 400 Hz | ±0.05% or less |

4.7.5 100 mV, 10 mV, and 1 mV Range Accuracy Test

4.7.5.1 Connect the equipment as shown below and set the TI sense switch to INT.

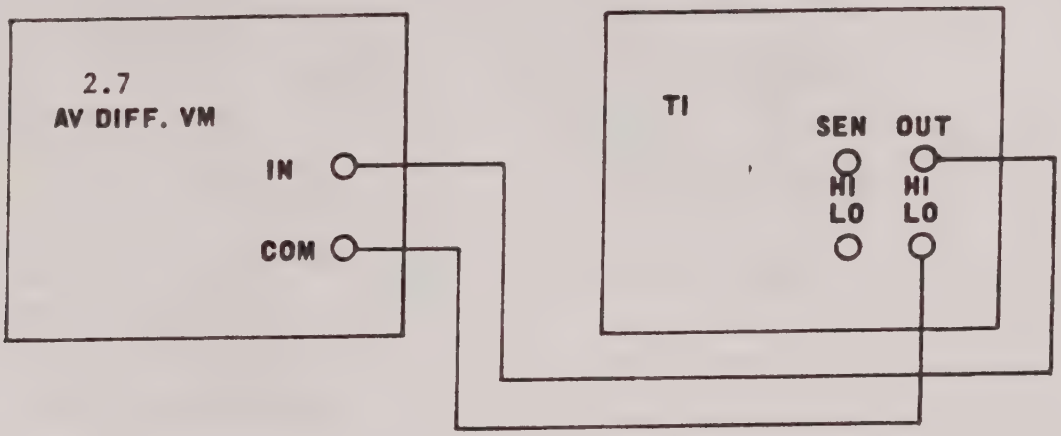



Figure 8. Millivolt Range Accuracy Tests

4.7.5.2 Set the TI ± VERNIER control to indicate the percent value that was recorded in step 4.7.1.10 at 100 kHz. Set the TI output frequency to 100 kHz. For the following steps, the differential voltmeter should be switched to TVM function to prevent meter pegging when further test measurements require changes in circuit-voltage settings.

4.7.5.3 Perform calibration in accordance with the following table as follows: Operation "a" means adjust the differential voltmeter to establish a reference null indication. Operation "b" means readjust the TI ± VERNIER control, switching the TI VOLTAGE-ERROR-% switch as required for the proper range, and verify that each reference null is re-established within the tolerance limits listed.

| TI VOLTAGE RANGE | TI VOLTAGE selection | Operation | Tolerance Limits |
|---|---|---|---|
| 1 V | 0.100000 | "a" | Ref. |
| 100 mV | 100.0000 | "b" | ±0.070% or less |
| 100 " | 10.00000 | "a" | Ref. |
| 10 " | 10.00000 | "b" | ±0.250% or less |
| 10 " | 1.000000 | "a" | Ref. |
| 1 " | 1.000000 | "b" | ±2.05% or less |

4.7.5.4 Perform steps 4.7.5.2 and 4.7.5.3 for the TI output frequency settings of 20 kHz and 30 Hz. Use the reference value recorded for 20 kHz and 30 Hz, as applicable, during step 4.7.5.2. At each frequency setting, verify the following relationships.

| TI VOLTAGE RANGE | Tolerance Limits |
|---|---|
| | 20 kHz or 30 Hz |
| 100 mV | ±0.03% or less |
| 10 " | ±0.12% " |
| 1 " | ±1.02% " |

4.7.5.5 Set the TI controls for minimum voltage output, and disconnect t test configuration.

4.8 TI EVALUATION

4.8.1 If the TI is a 5200A/5205A AC Calibration System and if all tests satisfactory, affix a "Special Calibration" label on the 5205A indicating t it is to be used only with the 5200A with which it is calibrated and that t are calibrated to 100 kHz.

Example: TI to be used with:
Fluke 5200A AC Calibrator
Ser. XXXX only.
System Calibrated to 100 kHz

| DOC NO. | NA 17-20AO-63 | MFG | MODEL | | | SER. NO. |
|---|---|---|---|---|---|---|
| PROCEDURE STEP NO. (1) | FUNCTION TESTED (2) | | NOMINAL (3) | MEASURED VALUES FIRST RUN (4) | MEASURED VALUES SECOND RUN (5) | OUT OF TOL (6) | CALIBRATION TOLERANCES (7) |
| 4.1 | Frequency Tests | | | | | | |
| 4.1.2 | Line V | Freq Range | (ms) | (ms) | | | (ms) |
| " | 105 | 100 Hz | 100.0 | | | | 98.0 to 102.0 |
| " | " | " | 10.00 | | | | 9.89 to 10.11 |
| " | 115 | 1 kHz | 9.00 | | | | 8.83 to 9.18 |
| " | " | " | 4.50 | | | | 4.43 to 4.57 |
| " | " | " | 3.00 | | | | 2.96 to 3.04 |
| 4.1.2 | 115 | 1 kHz | (KHz) | (Hz) | | | (Hz) |
| " | " | " | 0.4444 | | | | 439.0 to 449.8 |
| " | " | " | 0.5555 | | | | 548.9 to 562.1 |
| " | " | " | 0.6666 | | | | 658.9 to 674.3 |
| " | " | " | 0.7777 | | | | 768.9 to 786.5 |
| " | " | " | 0.8888 | | | | 878.9 to 898.7 |
| " | " | " | 0.9999 | | | | 988.0 to 1010.9 |
| " | " | " | 1.1111 | | | | 1099.0 to 1123.2 |
| " | 125 | 10 kHz | 5.000 | | | | 4940 to 5060 |
| " | " | " | 10.000 | | | | 9890 to 10,110 |
| " | " | 100 kHz | 50.000 | | | | 49,400 to 50,600 |
| " | " | " | 100.000 | | | | 98,900 to 101,100 |
| | | | | | | | |
| | | | NOTE | | | | |
| | Two independent subsections, 4.2 and 4.3, are provided for distortion type measurements. | | | | | | |
| | Completion of either subsection makes the other subsection inapplicable. | | | | | | |
| | | | | | | | |
| 4.2 | Harmonic Distortion And Noise Measurements Using The DMS (Item 2.3) | | | | | | |
| | Voltage Range | Freq Setting | Voltage Setting | | | | |
| 4.2.3.7 | 100 mV | 25 Hz | 100.0000 | ck ( ) | | | 0.050% or less |
| " | 1 V | " | 1.000000 | ck ( ) | | | 0.041% or less |
| " | 10 V | " | 10.00000 | ck ( ) | | | 0.040% or less |
| " | 100 V | " | 100.0000 | ck ( ) | | | 0.040% or less |
| | | | | | | | |
| | | | | | | | |

| TEST EQ NO | NA 17-20AQ-63 | MFG | MODEL | | | SER NO |
|---|---|---|---|---|---|---|
| PROCEDURE STEP NO (1) | FUNCTION TESTED (2) | | NOMINAL (3) | MEASURED VALUES FIRST RUN (4) | MEASURED VALUES SECOND RUN (5) | OUT OF TOL (6) | CALIBRATION TOLERANCES (7) |
| 4.2.3.7 | 100 V | 10 kHz | 100.0000 | ck ( ) | | | 0.040% or less |
| " | 10 V | " | 10.00000 | ck ( ) | | | 0.040% or less |
| " | 1 V | " | 1.000000 | ck ( ) | | | 0.041% or less |
| " | 100 mV | " | 100.0000 | ck ( ) | | | 0.050% or less |
| " | 100 mV | 50 kHz | 100.0000 | ck ( ) | | | 0.070% or less |
| " | 1 V | " | 1.000000 | ck ( ) | | | 0.061% or less |
| " | 10 V | " | 10.00000 | ck ( ) | | | 0.060% or less |
| " | 100 V | " | 100.0000 | ck ( ) | | | 0.060% or less |
| " | 100 V | 100 kHz | 100.0000 | ck ( ) | | | 0.140% or less |
| " | 10 V | " | 10.00000 | ck ( ) | | | 0.140% or less |
| " | 1 V | " | 1.000000 | ck ( ) | | | 0.141% or less |
| " | 100 mV | " | 100.0000 | ck ( ) | | | 0.150% or less |
| " | 10000 V* | " | 300.000 | ck ( ) | | | 0.200% or less |
| " | 10000 V* | 50 kHz | 300.000 | ck ( ) | | | 0.090% or less |
| " | 1000 V* | 10 kHz | 300.000 | ck ( ) | | | 0.050% or less |
| " | 1000 V* | 25 Hz | 300.000 | ck ( ) | | | 0.050% or less |
| | *For TI's with HV Amplifier only (5205A) | | | | | | |
| 4.3 | Harmonic Distortion and Noise: | | Without The DMS (Item 2.3) | | | | |
| | Voltage | Freq | Voltage | | | | |
| | Range | Setting | Setting | | | | (%) |
| 4.3.6 | 1 V | 100 Hz | 0.300000 | ck ( ) | | | Distortion 0.07% or less |
| 4.3.14 | 10 V | " | 3.0000 | ck ( ) | | | Distortion 0.43% or less |
| 4.3.19 | 1 | 1000 Hz | 0.300000 | ck ( ) | | | Distortion 0.07% or less |
| " | 10 | 1000 Hz | 3.0000 | ck ( ) | | | Distortion 0.43% or less |
| 4.3.21 | 1 | 20 kHz | 0.300000 | ck ( ) | | | Distortion 0.07% or less |
| " | 10 | 20 kHz | 3.0000 | ck ( ) | | | Distortion 0.43% or less |
| | Voltage | Freq | | | | | |
| | Select | Setting | | | | | |
| 4.3.22 | 100.0000 mV | 100.00 Hz | -- | ck ( ) | | | ±0.08% or less |
| " | " | 1.0000 kHz | -- | ck ( ) | | | " |
| " | " | 10.000 kHz | -- | ck ( ) | | | " |
| " | " | 50.00 kHz | -- | ck ( ) | | | " |
| " | " | 100.00 kHz | -- | ck ( ) | | | " |

Fluke 5200A, 5200 ) pt. 05, and 5200A/5205A AC Calibrator )

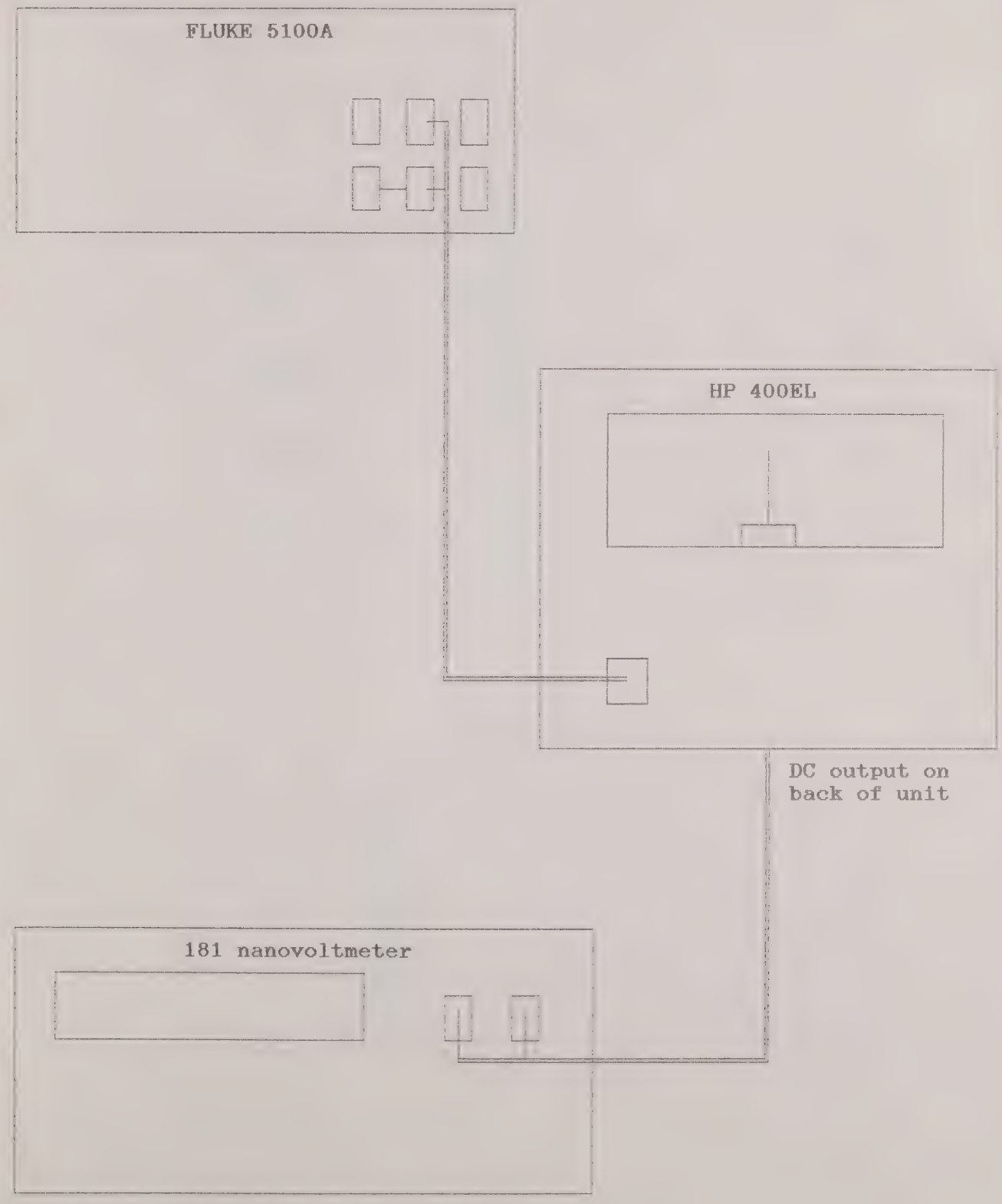
| PROC NO | NA 17-20AQ-63 | MFG | | MODEL | | | SER NO |
|---|---|---|---|---|---|---|---|
| PROCEDURE STEP NO (1) | FUNCTION TESTED (2) | | NOMINAL (3) | MEASURED VALUES FIRST RUN (4) | MEASURED VALUES SECOND RUN (5) | OUT OF TOL (6) | CALIBRATION TOLERANCES (7) |
| | Voltage | Freq | | | | | |
| | Select | Setting | | | | | |
| 4.3.22 | 1.000000 | 100.00 Hz | -- | ck ( ) | | | ±0.07 or less |
| " | " | 1 kHz | -- | ck ( ) | | | " |
| " | " | 10 kHz | -- | ck ( ) | | | " |
| " | " | 50 kHz | -- | ck ( ) | | | " |
| " | " | 100 kHz | -- | ck ( ) | | | " |
| " | 100.0000 | 100 Hz | -- | ck ( ) | | | " |
| " | " | 1 kHz | -- | ck ( ) | | | " |
| | Voltage | Freq | | | | | |
| | Select | Setting | | | | | (%) |
| 4.3.22 | 100.0000 | 10 kHz | -- | ck ( ) | | | ±0.07 or less |
| " | " | 50 kHz | -- | ck ( ) | | | " |
| " | " | 100 kHz | -- | ck ( ) | | | " |
| " | 0300.000 | 100 Hz | -- | ck ( ) | | | ±0.08 or less |
| " | " | 1 kHz | -- | ck ( ) | | | " |
| " | " | 10 kHz | -- | ck ( ) | | | " |
| " | " | 50 kHz | -- | ck ( ) | | | ±0.10 or less |
| " | " | 100.00 kHz | -- | ck ( ) | | | " |
| | | | | | | | |
| 4.4 | Line and Load Regulation Tests | | | | | | |
| 4.4.3 | Note ref: | | | | | | |
| 4.4.5 | 105 V line, 20Ω load | | -- | ck ( ) | | | Ref ±61 µV |
| 4.4.6 | 125 V line, 20Ω load | | -- | ck ( ) | | | Ref ±61 µV |
| 4.4.8 | 100 V; 30 Hz; 2kΩ load | | -- | ck ( ) | | | ±5 mV or less |
| " | 10 V; 20 kHz; 200Ω load | | -- | ck ( ) | | | ±600 µV or less |
| " | 500 V; 20 kHz; 10 kΩ load | | -- | ck ( ) | | | ±50 mV or less |
| 4.5 | Error Measurement Tests | | | | | | |
| | Voltage | Vernier | | | | | |
| | Error-% | error | | | | | |
| | range | | (V) | (V) | | | (V) |
| 4.5.4 | X.1 | 0 | 10.00000 | | | | 9.99990 to 10.00010 |
| | X.1 | +2% | 10.02000 | | | | 10.01959 to 10.02059 |

| PROC NO | NA 17-20AQ-63 | MFG | MODEL | | | SER NO |
|---|---|---|---|---|---|---|
| PROCEDURE STEP NO (1) | FUNCTION TESTED (2) | NOMINAL (3) | MEASURED VALUES FIRST RUN (4) | MEASURED VALUES SECOND RUN (5) | OUT OF TOL (6) | CALIBRATION TOLERANC (7) |
| | Voltage Vernier | | | | | |
| | Error-% error | | | | | |
| | range | (V) | (V) | | | (V) |
| 4.5.4 | X.1 -3% | 9.97009 | | | | 9.96959 to 9.97059 |
| " | X1 -3% | 9.70874 | | | | 9.70403 to 9.71345 |
| " | X1 +3% | 10.30928 | | | | 10.30397 to 10.31460 |
| " | X1 0% | 10.00000 | | | | 9.99900 to 10.00100 |
| 4.6 | Voltage Linearity Tests | | | | | |
| | Voltage Selection | | | | | (%) |
| 4.6.5 | 09.99999 | -- | ck ( ) | | | ±0.01 or less |
| " | 08.88888 | -- | ck ( ) | | | " |
| " | 07.77777 | -- | ck ( ) | | | " |
| " | 06.66666 | -- | ck ( ) | | | " |
| " | 05.55555 | -- | ck ( ) | | | " |
| " | 04.44444 | -- | ck ( ) | | | " |
| " | 03.33333 | -- | ck ( ) | | | " |
| " | 02.22222 | -- | ck ( ) | | | " |
| " | 01.11111 | -- | ck ( ) | | | " |
| 4.7.1 | 1 V Range Accuracy Tests | | (%) | | | |
| 4.7.1.9 | Freq at 10 Hz | -- | | | | ±0.105% or less |
| | Freq Selection | | (%) | | | (%) |
| 4.7.1.10 | 30 Hz | -- | | | | ±0.022 or less |
| " | 100 Hz | -- | | | | " |
| " | 1 kHz | -- | | | | " |
| " | 20 kHz | -- | | | | " |
| " | 50 kHz | -- | | | | ±0.055 or less |
| " | 100 kHz | -- | | | | " |
| 4.7.2 | 10 V Range Accuracy Tests | | | | | |
| | Freq Selection | | (%) | | | (%) |
| 4.7.2.3 | 10 Hz | -- | | | | ±0.105 or less |
| " | 50 Hz | -- | | | | ±0.022 or less |
| " | 100 Hz | -- | | | | " |
| " | 1 kHz | -- | | | | " |

| PROC NO | NA 17-20AQ-63 | MFG | MODEL | | | SER NO |
|---|---|---|---|---|---|---|
| PROCEDURE STEP NO (1) | FUNCTION TESTED (2) | | NOMINAL (3) | MEASURED VALUES FIRST RUN (4) | MEASURED VALUES SECOND RUN (5) | OUT OF TOL (6) | CALIBRATION TOLERANC (7) |
| | Freq Selection | | | (%) | | | (%) |
| 4.7.2.3 | 20 kHz | | -- | | | | ±0.055 or less |
| " | 50 kHz | | -- | | | | " |
| " | 100 kHz | | -- | | | | " |
| 4.7.3 | 100 V Range Accuracy Tests | | | | | | |
| | Freq - Selection | | | (%) | | | (%) |
| 4.7.3.3 | 10 Hz | | -- | | | | ±0.105 or less |
| " | 50 Hz | | -- | | | | ±0.022 or less |
| " | 100 Hz | | -- | | | | " |
| " | 1 kHz | | -- | | | | " |
| " | 10 kHz | | -- | | | | ±0.055 or less |
| " | 50 kHz | | -- | | | | " |
| " | 100 kHz | | -- | | | | " |
| 4.7.4 | 1000 V Range Constant-Gain Accuracy Tests (Fluke 5200A/5205A) | | | | | | |
| | Voltage | Freq. | | (%) | | | (%) |
| 4.7.4.5 | 500 V | 300 Hz | -- | | | | ±0.130 or less |
| " | " | 20 kHz | -- | | | | ±0.044 or less |
| " | " | 50 kHz | -- | | | | ±0.09 or less |
| " | " | 100 kHz | -- | | | | ±0.12 or less |
| | Voltage | Freq. | | (%) | | | (%) |
| 4.7.4.7 | 350 V | 30 Hz | -- | | | | ±0.134 or less |
| " | 350 V | 50 kHz | -- | | | | ±0.094 or less |
| " | 300 V | 100 kHz | -- | | | | ±0.133 or less |
| " | 200 V | 50 kHz | -- | | | | ±0.105 or less |
| " | 200 V | 400 Hz | -- | | | | ±0.05 |
| 4.7.5 | 100 mV, 10 mV, and 1 mV Range Accuracy Test | | | | | | |
| | Freq Voltage Range and Output | | | | | | |
| 4.7.5.3 | 100 kHz | 100 mV | -- | | | | ±0.070 or less |
| " | " | 10 mV | -- | | | | ±0.250 or less |
| " | " | 1 mV | -- | | | | ±2.05 or less |
| 4.7.5.4 | 20 kHz | 100 mV | -- | | | | ±0.03 or less |
| " | " | 10 mV | -- | | | | ±0.12 or less |

| PROC NO | NA 17-20AQ-63 | MFG | MODEL | | | SER NO |
|---|---|---|---|---|---|---|
| PROCEDURE STEP NO (1) | FUNCTION TESTED (2) | NOMINAL (3) | MEASURED VALUES FIRST RUN (4) | MEASURED VALUES SECOND RUN (5) | OUT OF TOL (6) | CALIBRATION TOLERANCES (7) |
| | Freq Voltage Range and Output | | | | | |
| 4.7.5.4 | 20 kHz 1 mV | -- | | | | ±1.02 or less |
| " | 30 Hz 100 mV | -- | | | | ±0.03 or less |
| " | " 10 mV | -- | | | | ±0.12 or less |
| " | " 1 mV | -- | | | | ±1.02 or less |
| 4.8.1 | Special cal label for 5205A | -- | ck ( ) | | | Label affixed |
| Affix a special calibration label stating: "The TI output voltages have been calibrated up to 100 kHz only." | | | | | | |

John Fluke
5100A AC Calibrator
Equipment set - up for millivolt ranges



MFG. Fluke

MODEL NO. 5200A

SERIAL NO.

TECHNITION

DATE

## AC VOLTAGE

| Voltage Range | Freq. Range | Voltage Setting | Freq. Setting | Reading | Tolerance |
|---|---|---|---|---|---|
| 1V | 1.0KHz | 1.0V | 1.0KHz | | 1.0002 TO 0.9998 |
| | 100KHz | | 20KHz | | |
| | | | 100KHz | | 1.0005 TO 0.9995 |
| | 1MHz | | 1MHz | | 1.0033 TO 0.9967 |
| 10V | 1KHz | 1.0V | 1KHz | | 1.0004 TO 0.9996 |
| | 100KHz | | 20KHz | | |
| | | | 100KHz | | 1.0010 TO 0.9990 |
| | 1.0MHz | | 1.0MHz | | 1.0066 TO 0.9934 |
| | 1.0KHz | 10.0V | 1KHz | | 10.002 TO 9.9980 |
| | 100KHz | | 20KHz | | |
| | | | 1.0KHz | | 10.005 TO 9.9950 |
| | 1MHz | | 1MHz | | 10.036 TO 9.9640 |
| 100V | 1KHz | 100V | 1KHz | | 100.036 TO 99.960 |
| | 100KHZ | | 20KHz | | |
| | | | 100KHz | | 100.050 TO 99.950 |

## FREQUENCY ACCURACY

| RANGE | FREQUENCY | READING | TOLERANCE |
|---|---|---|---|
| 100Hz | 50Hz | | 50.6 TO 49.4 |
| | 100Hz | | 101.1 TO 98.9 |
| 1KHz | 500Hz | | 500.6 TO 494 |
| | 1KHz | | 1011 TO 989 |
| 10KHz | 5KHz | | 5060 TO 4940 |
| | 10KHz | | 10110 TO 9890 |
| 100KHz | 50KHz | | 50600 TO 49400 |
| | 100KHz | | 101.1K TO 98.9K |
| 1MHz | 500KHz | | 518K TO 482KHz |
| | 1MHz | | 1033K TO 967KHz |

MFG. Fluke

MODEL NO. 5200A

SERIAL NO.

TECHNITION

DATE

## DISTORTION CHECK

| FREQUENCY | READING | TOLLERANCE |
|---|---|---|
| 10Hz | | 0.04% |
| 50Hz | | |
| 100Hz | | |
| 500Hz | | |
| 1KHz | | |
| 5KHz | | |
| 10KHZ | | |
| 20KHz | | |
| 50KHz | | |
| 100KHz | | 0.30% |
| 200KHz | | |
| 500KHz | | |
| 750KHz | | |
| 1MHz | | |

| Document Title: Product Manuals | Document Number: ESC-0441-92-01 |
|---|---|
| Revision Number: A_ B_ C_ D_ E_ | Page: N/A |
| Prepared By: Rick Schultz | Approved By: |
| Issued By: Jim Steinau | Issue Date: 10/19/93 |

## CHANGE NOTICE SUMMARY

| Revision | Reason for Change | Date of Change |
|---|---|---|
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